REMARKS/ARGUMENTS

Favorable reconsideration of this application, as presently amended and in light of the following discussion, is respectfully requested.

Claims 18-28 are currently pending in this application. Claim 25 is currently amended. The changes and additions to the claims do not add new matter and are supported by the originally filed specification at least on page 9, lines 27-30.

In the outstanding Office Action, Claim 25 was rejected under 35 U.S.C. §101 as being directed to non-statutory subject matter; and Claims 18-28 were rejected under 35 U.S.C. §103(a) as unpatentable over Keller at al. (Vehicular Technology, IEEE Transactions on, Vol. 49, Issue 5, September 2000, pages 1893-1906, hereafter "Keller") in view of Hashem et al. (U.S. Patent No. 6, 701,129, hereafter "Hashem").

With respect to the rejection of Claim 25 under 35 U.S.C. §101, Applicants respectfully submit that the amendment to Claim 25, which now recites a computer-readable medium, overcomes this ground of rejection. Support for these changes can be found in the originally filed specification on page 9, lines 27-30. No new matter has been added. M.P.E.P. §2106.01 states, "[w]hen functional descriptive material is recorded on some computer-readable medium, it becomes structurally and functionally interrelated to the medium and will be statutory in most cases since use of technology permits the function of the descriptive material to be realized." Therefore, it is respectfully requested that this rejection be withdrawn.

With respect to the rejection under 35 U.S.C. §103(a), Applicants respectfully traverse this rejection for the reasons discussed next.

Briefly recapitulating, Claim 18 is directed to a wireless multicarrier transmission method, where a multicarrier transmission uses *n* modulated frequency subcarriers (*n* is an integer number) and a fading condition of each subcarrier is detected to generate fading

channel profile information. The modulation of each subcarrier is determined by precalculating a plurality of adaptive loading tables, each loading table containing x subcarriers for modulation with a lower modulation scheme, y subcarriers for modulation with a standard modulation scheme, and z subcarriers for modulation with a higher modulation scheme (x, y, and z are integer numbers), the sum of x, y, and z is *n* and a resulting number of coded bits of a multicarrier symbol is constant, selecting one of the adaptive loading tables for said multicarrier transmission, and modulating the x subcarriers having low fading channel profile information with the lower modulation scheme, modulating the y subcarriers having medium fading channel profile information with the standard modulation scheme, and modulating the z subcarriers having high fading channel profile information with the higher modulation scheme.

Independent Claims 25 and 26 contain similar features to independent Claim 18, thus the following discussion pertains to independent Claims 18, 25 and 26.

In a non-limiting example, Fig. 4 shows a wireless multicarrier transmission method where a multicarrier transmission uses 48 (for example) modulated frequency subcarriers (see Specification, page 12, line 30), a fading condition of each subcarrier is detected to generate a fading profile 9, and the modulation of each subcarrier is determined by precalculating the plurality of adaptive loading tables (see Specification, Tables 3-5), selecting one of the adaptive loading tables for the multicarrier transmission (Fig. 4, step 13), and modulating the subcarriers (see page 16, lines 7-10). In the example, each of the precalculated plurality of adaptive loading tables (see Specification, Tables 3-5) contains x subcarriers for modulation with a lower modulation scheme, y subcarriers for modulation with a standard modulation scheme, and z subcarriers for modulation with a higher modulation scheme (x, y, and z are integer numbers), the sum of x, y, and z is 48 (for example) and a resulting number of coded bits of a multicarrier symbol is constant (see Specification, page 13, lines 21-22).

In other words, the loading tables include three numbers x, y, and z defining how many subcarriers are to be modulated with a lower, a standard, and a higher modulation scheme respectively. The calculated loading tables are independent of any specific subcarrier and only defines in an abstract way the number of subcarriers to associate with a given scheme.

Turning to the applied art, Keller teaches an adaptive modulation method for duplex OFDM transmission. Keller teaches using *N* subcarriers (Section II.A, para. 1), detecting a fading condition (Section II.A, para. 2), and choosing a modulation scheme for multicarrier transmission (Section II.D, para. 2-3).

As admitted in the outstanding Office Action, Keller fails to disclose or suggest precalculating a plurality of adaptive loading tables, each loading table containing x subcarriers for modulation with a lower modulation scheme, y subcarriers for modulation with a standard modulation scheme, and z subcarriers for modulation with a higher modulation scheme, as required by Claim 18. The outstanding Office Action relies on Hashem to provide these features.

Hashem relates to a digital radio communication system that is trying to reduce the overhead transmitted between two radio communication units, where the overhead describes the channel quality and the optimum transmission parameters for each subcarrier of a system such as an orthogonal frequency division multiplexing (OFDM) system (see abstract).

Within the system of Hashem, a base station transmits a frame of data to a remote unit by using a current base station link mode (LM). A link mode is thereby a set of at least one mission parameter, such as a modulation level or a coding rate. It is possible to store a table of load link modes in the memory of the base station and to refer to a given link mode by means of an index. The load link modes are either predetermined or negotiated with the remote unit when a transmission is initiated (see col. 3, lines 41-56).

If the base station transmits signals along multiple subcarriers such as in an OFDM system, a current remote unit link mode including a set of at least one transmission parameter (for example, modulation level or coding rate) is stored for each subcarrier. The remote unit then detects the channel quality for each subcarrier and selects a desired link mode for each subcarrier. Alternatively, a desired link mode can be determined for each of a plurality of groups of subcarriers (see col. 7, lines 1 to 3). A difference may then be calculated for each group of subcarriers and the difference for each group may be transmitted to the base station such that data can be sent by the base station according to the desired link modes in a next step.

In Hashem, an adequate link mode, i.e., an adequate modulation level, is selected for each subcarrier separately (see col. 6, last paragraph). Alternatively, the modulation level can be selected not only for each specific subcarrier, but for a group of subcarriers (see col. 7 lines 1-3). On col. 7, lines 7-9, Hashem specifies that:

> calculating a desired LM [i.e., a desired modulation level] for a group of adjacent subcarriers will usually result in an optimum LM [i.e., modulation level] for each subcarrier in the group.

This simply means that the modulation scheme is selected in view of the overall channel quality of the group of subcarriers, and that this scheme is an optimum scheme for the whole group of subcarriers. But this also means that the selected modulation scheme for the group does not reflect the channel quality of each subcarrier of the group, and that the selected scheme is not optimum for each subcarrier of the group.

As the selected scheme is not optimum for each single subcarrier, it will not be possible using the method of Hashem to guarantee that the subcarrier having low fading channel profile information is modulated with the lower modulation scheme. Further it will not be possible to modulate the subcarriers having medium fading channel profile

information with the standard modulation scheme, and to modulate the subcarriers having high fading channel profile information with the higher modulation scheme.

Therefore, Hashem fails to disclose or suggest ***loading tables containing x subcarriers for modulation with a lower modulation scheme, y subcarriers for modulation with a standard modulation scheme, and z subcarriers for modulation with a higher modulation scheme***, as required by Claim 18.

Additionally, Hashem does not precalculate (or "predetermine" according to the wording of Hashem on col. 3 line 51) an adaptive loading table as recited in Claim 18, but only an allowed link mode (see col. 3, line 50). Because a link mode includes parameters such as the modulation level, the "table of allowed link modes" that is "predetermined" by Hashem is only a list of allowed modulation levels. Such a table of allowed link modes according to Hashem is not the same as an "adaptive loading table" as recited in Claim 18 because it does not specify the number of subcarriers to be modulated with the respective modulation levels.

Thus, Hashem also fails to disclose or suggest the step of ***precalculating a plurality of loading tables***, as required by Claim 18.

Therefore, Hashem fails to cure the deficiencies of Keller as suggested by the Office Action.

M.P.E.P. §2143.03 requires that to establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested in the prior art. Therefore, with the applied art not having the claimed features noted above, it is respectfully submitted that Claim 18 (and all associated dependent claims) patentably distinguish over Keller and Hashem, either alone or in combination.

Additionally, Applicants respectfully submit that there would be no reason to incorporate the teaching of Hashem in the method of Keller. The MPEP states that it is

improper to combine references where the references teach away from their combination (see MPEP §2145 X.D.2).

According to Hashem, a desired link mode or modulation level is determined by the remote unit (see col. 5, lines 37 to 39). On the other hand, Keller describes that a modulation scheme allocation for each subcarrier is performed by the base station or transmitter, as suggested by the first paragraph of section E on page 1898 (see the term "adaptive OFDM receiver").

Therefore, it would not be obvious to one of ordinary skill in the art to combine a communication method in which a transmitter selects the modulation scheme, as in Keller, with another communication method that prescribes that the receiver (the remote unit) needs to select the modulation scheme to be used, as in Hashem.

Furthermore, Applicants note that Keller performs a recursive modulation adaptation (see page 1898) consisting of (i) calculating a cost value for each subcarrier, (ii) increasing the modulation scheme of the subcarrier having the lowest cost value, and (iii) repeating recursively steps (i) and (ii) until a given number of bits can be transmitted over one OFDM symbol.

The link mode determination of Hashem, i.e., the modulation level determination, differs from that of Keller in that the modulation is selected for each subcarrier in accordance with the channel quality of the subcarrier. This selection method does not require any recursive step and is not compatible with a recursive selection of modulation schemes.

As described above, the adaptation method of Keller includes a comparison of the cost value associated with each subcarrier. In other words, the modulation scheme chosen for a specific subcarrier of the OFDM system depends on the channel quality of all other subcarriers of the OFDM system. On the contrary, Hashem teaches a method of selecting a modulation scheme for a subcarrier only according to the channel quality of that subcarrier.

Therefore, a person of ordinary skill in the art would not be motivated to combine Keller, which describes an adaptation method taking account of the quality of the whole frequency domain of the OFDM system, with Hashem, which describes an adaptation method taking account of the quality of only the respective subcarrier.

Therefore, Applicants respectfully submit that Claims 18-28 (and all associated dependent claims) patentably define over Keller and Hashem, either alone or in combination.

Consequently, in light of the above discussion and in view of the present amendment, the outstanding grounds for rejection are believed to have been overcome. The present application is believed to be in condition for formal allowance. An early and favorable action to that effect is respectfully requested.

Respectfully submitted,

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